

ADDITIONAL NOTES ON THE GENUS *Gmelina*. III

Harold N. Moldenke

Gmelina L.

Additional bibliography: Hooper, Pharm. Journ. Trans., ser. 3, 22: 573. 1892; Kraemer, Am. Journ. Pharm. 66: 538. 1894; Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] 3, 96--102, & [129], pl. 8, fig. 1--7. 1921; Wise, Murphy, & D'Addieco, Paper Trades Journ. 122: 2 & 35. 1946; Setten, Malay. For. 16: 165--169. 1953; Munir in Morley & Toelken, Flow. Pl. Austral. 286--288, fig. 174 b & c. 1983; Mold., Phytologia 55: 424--442, 460--499, 507--509, 511, & 512. 1984.

Gmelina arborea Roxb.

Additional bibliography: Hooper, Pharm. Journ. Trans., ser. 3, 22: 573. 1892; Kraemer, Am. Journ. Pharm. 66: 538. 1894; Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] 96--100 & 192, pl. 8, fig. 4--7. 1921; Wise, Murphy, & D'Addieco, Paper Trades Journ. 122: 2 & 35. 1941; Setten, Malay. For. 16: 165--169. 1953; Mold., Phytologia 55: 460--473, 493, 494, & 497. 1984.

Additional illustrations: Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] [97], pl. 8, fig. 4--7. 1921.

Gmelina asiatica L.

Additional bibliography: Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] [97] & 101--102, pl. 8, fig. 1 & 2. 1921; Mold., Phytologia 55: 473--497. 1984.

Additional illustrations: Hubert, Trav. Lab. Mat. Méd. Pharm. 13: [Verb. Util. Mat. Méd.] [97], pl. 8, fig. 1 & 2. 1921.

Gmelina brassii Mold.

Additional bibliography: Mold., Phytologia 55: 499. 1984.

Leaf-blade secondaries flat above, prominent beneath; veinlet reticulation very abundant, flat and not conspicuous above, beautifully prominent to the finest details beneath; inflorescence terminal, to 25 or more cm. long, 2--4 cm. wide, erect, racemose or pseudospicate, densely many-flowered, paniculately branched at and toward the base with very short erect branches, the upper flowers arranged in subsessile cymules, densely short-puberulent throughout with brownish hairs, very conspicuously bracteolate and glanduliferous; peduncles 3--4.5 cm. long, similar to the upper portion of the branchlets in all respects; sympodia 1--2.7 cm. long, more conspicuous toward the apex of the inflorescence; bractlets very numerous and conspicuous, elliptic or lanceolate, 5--17 mm. long, 1.5--8 mm. wide, tapering to the apex or caudate-acuminate, sessile, tapering to the base or the largest ones basally broadly rounded, densely short-puberulent on both surfaces, usually conspicuously glanduliferous with 1--3 large, flat, black glands on the lower surface; pedicels very short, puberulent; calyx densely puberulent, usually also black-glanduliferous; corolla white, purplish, pale-purple, or yellowish with a

purple lip, sometimes purplish-white with a yellow-crested lip or pale-lilac with darker markings, to 2 cm. long, externally densely appressed-puberulent, the lower lip faintly blue with 2 yellow markings; fruit drupaceous, 10--14 mm. long and wide, green and blue-tipped when young, enclosed basally by the fruiting-calyx, black or purple when ripe.

This species is based on *Brass* 21915 from a rainforest on limestone, at 30 m. altitude, at Dabora, on the Cape Vogel peninsula, Milne Bay District, Papua, New Guinea, collected on April 10, 1953, deposited in the herbarium of the Department of Forests at Lae, New Guinea. A recorded vernacular name for the species is "alongaya" and its wood is used for carving drums. A wood sample accompanies *Croft & al.* LAE.68823.

Collectors have found this plant growing at the margins of *Pandanus* swampy gullies, at the edges of rainforests, behind beach strand, and in disturbed lowland forests, at 17--100 m. altitude, in flower in November, and in fruit in June. It is frequent as a minor canopy tree and in the subsidiary layer of rainforests. It has been found in both flower and fruit in March and April. Womersley mistakenly refers to the flowers as being in "terminal heads".

Citations: NEW GUINEA: Papua: *Brass* 21719 (Ng--17096), 21915 (Ng--17164--type); L. S. Smith 1298 (Ld, Ng--6594, Ng--16969); Womersley 8680 (Ng--16845). Fergusson Island: *Brass* 27281 (W--2408550); *Croft & al.* LAE.68823 (Mu). Normanby Island: *Brass* 25383 (W--2408135); *Croft & al.* LAE.68878 (Mu).

GMELENA CHINENSIS Benth., Fl. Hongk. 272. 1861 [not *G. chinensis* L., 1962].

Bibliography: Benth., Fl. Hongk. 272. 1861; Maxim., Bull. Acad. Imp. Sci. St.-Petersb. 3: 81. 1886; Maxim., Mém. Biol. 12: 514. 1886; Oliv. in Hook. f., Icon. 19: 3, pl. 1874. 1889; Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26 [Ind. Fl. Sin. 2]: 257. 1890; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039. 1893; Dunn & Tutcher, Kew Bull. Misc. Inf. Addit. Ser. 10: 203. 1912; Dop, Bull. Soc. Bot. France 61: 323. 1915; H. Hallier, Meded. Rijks Herb. Leid. 37: 56 & 58. 1918; Chung, Mem. Sci. Soc. China 1 (1): 227. 1924; Stapf, Ind. Lond. 3: 299. 1930; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 116--117. 1932; Dop, Rev. Internat. Bot. Appliq. Agric. Trop. 13: 896. 1933; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 57, 58, 73, & 93. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 1039. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 132, 135, 160, & 186. 1949; Mold., Résumé 170, 174, 218, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1039. 1960; Mold., Résumé Suppl. 3: 19 & 32. 1962; Tingle, Check List Hong Kong Pl. 38. 1967; Mold., Fifth Summ. 1: 289, 292, 294, & 363 (1971) and 2: 879. 1971; Hsiao, Fl. Taiwan 6: 12. 1980; Mold., Phytol. Mem. 2: 279, 281, 283, 354, & 549. 1980; Raj, Rev. Paleobot. Palyn. 39: 356, 372, & 395. 1983; Mold., Phytologia 55: 330, 335, 468, 493, 494, 498, & 499. 1984.

Illustrations: Oliv. in Hook. f., Icon. 19: pl. 1874. 1861.

A low bush or bushy shrub, rarely a small tree, 2--3.2 m. tall, often conspicuous on the landscape; branches and branchlets glabrous;

leaves decussate-opposite; petioles 2.5--5 cm. long, canaliculate above, pubescent when young, later glabrous; leaf-blades chartaceous, oblong-ovate or ovate to elliptic, 6--14 cm. long, 4.5--5.5 cm. wide, apically acute or acuminate, basally cuneate or subtruncate, marginally entire, dull-green or dull deep-green and glabrous above, somewhat (but not conspicuously) bluish-green and minutely farinose beneath, often basally trinerved and occasionally with 2 or 3 glands between the secondaries there; secondaries 3--5 per side; inflorescence terminal, paniculate, short and narrow, slightly pubescent or tomentose; bracts foliaceous, small, apically obtuse, caducous; flowers conspicuous, fragrant; calyx campanulate, 7--8 mm. long, 5 mm. wide, green, persistent, externally glandulose and slightly downy or hoary, internally glabrous, usually with 1--3 large (or small) glands, the rim truncate, with 5 distant and minute teeth; corolla large, about 3 cm. long, 2.5 cm. wide at the throat, somewhat bilabiate, only slightly oblique, mostly yellow or orange (at least externally), internally white or bright-orange, the upper lip often purple, the lower lip orange or red-tinged, externally only minutely whitish-farinose, densely glandulose, internally sparsely so, the tube short, the limb usually 4-lobed, rarely 5-lobed; stamens 4, didynamous, inserted in the corolla-tube; filaments glabrous; anthers divaricate; style apically unequally bilobed, one lobe very minute; ovary 4-celled, externally densely pubescent on the upper portion, glabrous below; fruit obovate, about 2.2 cm. long, 1.5 cm. wide in the upper half, 5 mm. wide near the base.

The species is based on an unnumbered Wright collection from the New Territory part of Hong Kong, deposited in the Kew herbarium. The species greatly resembles *G. hainanensis* Oliv. in general appearance, but differs in its truncate calyx and ovate-elliptic and less glaucous leaves. Dop (1933) comments on its close resemblance, also, to *G. lecomtei* Dop [now regarded as a synonym of *G. racemosa* (Lour.) Merr.]: *G. chinensis* being mostly only a shrub, 2--3 m. tall, with only 1--3 very large calicinal glands and a 4-lobed corolla, while *G. lecomtei* is a tree, 10--15 m. tall, with very numerous small calicinal glands and a 5-lobed corolla.

Raj (1983) has studied the pollen of *G. chinensis* on the basis of *Hu 10231* from Lantau Island in the Stockholm herbarium.

Yip describes the plant which he collected, cited below, as a "woody climber, leaves darker green above". Collectors have encountered *G. chinensis* on stream banks and on plains, in ravines, and along open roadsides, at 600 m. altitude, in flower from April to June, and in fruit in June.

Dunn & Tutcher (1912) list this species from Lantau Island and from Hong Kong's New Territory. P'ei (1932) cites *Ying 628* from Lantau, *Wright s.n.* from Hong Kong, and *Chun 3075* and *McClure 378* from Kwangtung. Forbes & Hemsley (1890) cite an unnumbered Ford collection from Lantau and of Wright from Hong Kong, deposited in the Kew and British Museum herbaria. They comment that "Since the publication of the figure in Hooker's 'Icones Plantarum' Mr. Ford has sent excellent flowering specimens to Kew from which we learn that the inflorescence is furnished with many deciduous bracts." Tingle (1967) lists it only from Hong Kong, as does Hsiao (1980),, listing the vernacular

name, "shih mu" [=stone-wood] in Chinese characters.

Hallier (1918) cites his no. C.242 from material cultivated in Hong Kong. He comments that "Das von mir gesammelte Exemplar reicht nicht aus, um zu entscheiden, ob auch *Balansa* no. 3806 von Tonking zu dieser Art gehört". Dop (1915) cites this collection as a cotype of his *G. balansae*, noting that "Cette espèce est voisine du *Gm. chinensis* Benthams; elle s'en distingue par la dimensions des feuilles, les inflorescences et les lobes stigmatiques egaux". The Dop reference is often cited as "1914", but was not actually published until 1915.

The corollas are described as "yellow" on *Chan 1083*, *Hu 10231*, and *Taam 2153*, as well as by Dunn & Tutcher (1912), "bright-yellow" on *Tso 21490*, "orange" on *Chan 1073*, "purple, lower lip orange" on *Hom 186*, and "Blüthen innen prächtig orange, mit purpurner Oberlippe" on *Hallier C, 242*.

P'ei (1932) differentiates *G. chinensis* from the other Chinese species known to him as follows:

1. Calyx truncate or shortly toothed, the teeth not over 1.5 mm. long.
2. Ovary densely pubescent; calyx truncate or with rudimentary teeth; leaves elliptic-ovate.....*G. chinensis*.
- 2a. Ovary glabrous or nearly so; calyx dentate; leaves broadly ovate.
3. Erect trees; leaves large, 10--25 cm. long, 5--18 cm. wide; inflorescence erect.....*G. arborea*.
- 3a. Scandent shrubs (at least when young); leaves small, not over 10 cm. long; inflorescence pendulous.....*G. asiatica*.
- 1a. Calyx distinctly lobed, the lobes to 11 mm. long.
4. Ovary densely pubescent; calyx with many large glands; leaves large, usually 7--15 cm. long, 5.5--7 cm. wide; inflorescence terminal, dense.....*G. hainanensis*.
- 4a. Ovary glabrous; calyx usually with only a few large glands; leaves small, not over 2.5 cm. long; inflorescence terminal, lax.....*G. delavayana*

Material of *G. chinensis* has been misidentified and distributed in some herbaria as *G. arborea* Roxb. On the other hand, the *Pételot 1058 & 1941*, distributed as *G. chinensis*, actually are *G. balansae* Dop, while *Clemens & Clemens 3980* is *G. racemosa* (Lour.) Merr.

Citations: CHINA: Kwangtung: *Chun 3075* (Bz--21266, Bz--21267, N, N, Qu); *Hom 186* (N); *Tso 21490* (N); *Yip 232* (Ac). CHINESE COASTAL ISLANDS: Lantau: *Chan 1073* (Mi), *1083* (Mi); *Hu 10231* (Mi, W--2731167); *Taam 2153* (Ca--82394, Mi, N, W--2072893); *Tsiang 628* (N--photo); *Ying 628* (Ca--358250). HONG KONG: *C. Wright, Wilkes Exped. s.n.* [Hong Kong] (T--isotype, W--44913--isotype). MOUNTED ILLUSTRATIONS: Oliv. in Hook. f., Icon. 19: pl. 1874. 1861 (Ut--73879).

Gmelina DALRYMPLEANA (F. Muell.) H. J. Lam, Verbenac. Malay. Arch. 223--224. 1919.

Synonymy: *Vitex* (?) *macrophylla* R. Br., Prodr. Fl. Nov. Holl. 1: 512. 1810 [not *Gmelina macrophylla* Anon., 1927, nor Hort., 1940, nor H. J. Lam, 1919]. *Vitex dalrympleana* F. Muell., Fragm. Phyt. Austral. 4: 128, 1858. *Ephielis simplicifolia* Soland. ex Seem., Journ. Bot. Lond. 3: 259. 1865. *Vitex* (?) *macrophylla* A. Br. ex Seem., Journ.

Bot. Lond. 3: 259 in syn. 1865. *Gmelina macrophylla* (R. Br.) Benth., Fl. Austral. 5: 65. 1870 [not *G. macrophylla* Wall., 1829]. *Gmelina macrophylla* Benth. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1039. 1893. *Ephialis simplicifolia* Soland. ex Mold., Alph. List Inv. Names 24 in syn. 1942. *Ephialis simplicifolia* Solander ex Mold., Alph. List Inv. Names 24 in syn. 1942. *Ephialis simplicifolia* Seem ex Mold., Alph. List Inv. Names 24 in syn. 1942. *Gmelina dalrympiana* (F. Muell.) H. J. Lam ex Mold., Résumé 285. 1959. *Gmelina dalrympleana* F. Muell. ex Fong & al., Lloydia 35: 147. 1972.

Bibliography: R. Br., Prod. Fl. Nov. Holl. 1: 512. 1810; Steud., Nom. Bot., ed. 1, 885. 1821; D. Dietr., Syn. Pl. 3: 611. 1843; Voigt, Hort. Suburb. Calc. 470. 1845; Schau. in A. DC., Prodr. 11: 695. 1847; Buek, Gen. Spec. Syn. Candol. 3: 502. 1858; F. Muell., Fragm. Phyt. Austral. 4: 128. 1858; Seem., Journ. Bot. Lond. 3: 258--259. 1865; Seem., Fl. Vit. 189. 1866; Benth. & Muell., Fl. Austral. 5: 65. 1870; R. Schomb., Fl. S. Austral. 52. 1875; F. Muell., Descrip. Notes Papuan Pl., imp. 1, 8: 46. 1885; F. Muell., Sec. Syst. Cens. Austral. Pl. 1: 173. 1889; K. Schum. & Hollr., Fl. Kais. Wilhelmsl. 120. 1889; F. M. Bailey, Cat. Indig. Nat. Pl. Queensl. 35. 1890; Burck, Ann. Jard. Bot. Buitenz., ser. 1, 10: 98. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 844 & 1039 (1893) and imp. 1, 2: 1213. 1895; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 173. 1895; K. Schum. & Lauterb., Fl. Deutsch. Schutzgeb. Südsee 524. 1900; F. M. Bailey, Queensl. Fl. 4: 1177 & 1178. 1901; Banks & Soland., Bot. Cook's Voy. 2: pl. 238. 1901; H. Hallier, Jahrb. Hamb. Wiss. Anst. 22 (3): 31--46. 1905; Pulle in Lorentz, Nova Guinea, ser. 1, 8 (1): 402. 1911; F. M. Bailey, Compreh. Cat. Queensl. Pl. 386. 1913; H. Hallier, Meded. Rijks Herb. Leid. 37: 56--57. 1917; H. J. Lam, Verbenac. Malay. Arch. 216, 220--221, 223--224, 365, & 366. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 68. 1921; Bakh., Journ. Arnold Arb. 10: 71 & 72. 1929; Bakh. in White, Journ. Arnold Arb. 10: 264. 1929; Junell, Symb. Bot. Upsal. 1 (4): 92. 1934; Bakh., Journ. Arnold Arb. 16: 73. 1935; Beer & Lam, Blumea 2: 226. 1936; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 573. 1941; Mold., Alph. List Inv. Names 12 & 25. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 26, 67, 69, & 93. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 844 & 1039 (1946) and imp. 2, 2: 1213. 1946; H. N. & A. L. Mold., Pl. Life 2: 55. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 148, 149, 153, & 186. 1949; E. D. Merr., Journ. Arnold Arb. 31: 113. 1950; Mold., Résumé 201--203, 209, 285, 296, 297, 386, & 456. 1959; Burkill, Dict. Econ. Prod. Malay Penins. 1: 953. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 844 & 1039 (1960) and imp. 3, 2: 1213. 1960; Burkill, Dict. Econ. Prod. Malay Penins. 1: 1105. 1966; Whitmore, Gard. Bull. Singapore 22: 19--21. 1967; Uphof, Dict. Econ. Pl., ed. 2, 246. 1968; Chippendale, Proc. Linn. Soc. N. S. Wales 96: 236. 1971; Mold., Fifth Summ. 1: 333, 336, 338, 346, & 441 (1971) and 2: 523, 524, 716, 721, & 879. 1971; Farnsworth, Pharmacog. Titles 7 (10): vii. 1972; Fong, Trojánkova, Trojánek, & Farnsworth, Lloydia 35: 147. 1972; T. B. Muir, Muellera 2: 167. 1972; [Farnsworth], Pharmacog. Titles 7, Cum. Gen. Ind. [53]. 1975; Kooiman, Act. Bot. Neerl. 24: 462. 1975; F. Muell., Descrip. Notes Papuan Pl., imp. 2, 6: 46. 1979; Mold., Phytologia 46: 490 & 491. 1980; Mold., Phytol. Mem. 2: 323, 327,

328, 337, 409, & 549. 1980; Mold., *Phytologia* 51: 391 (1982) and 55: 333, 335, 336, 482, & 493. 1984.

Illustrations: Banks & Soland., *Bot. Cook's Voy.* 2: pl. 236. 1901.

A small or large bushy tree, to 13 m. tall, often handsomely pyramidal; trunk smooth or rough, with dark bark; branchlets minutely hairy when young, later glabrous; wood close-grained, the outer or sapwood prominently marked, "of a pretty purple colour", the remainder gray; leaves decussate-opposite, clustered at the ends of the branchlets; petioles variable in length, usually 2--3 cm. long, at first minutely hairy, later glabrescent; leaf-blades stiffly coriaceous, broadly ovate or ovate-oblong, 10--27 cm. long, 7--16 cm. wide, but variable in size, especially in width of the base, apically subobtuse-ly acuminate, marginally entire, basally cordate or rounded, glabrous and shiny on both surfaces except for the venation beneath, often wrinkled above, usually paler and more or less gray beneath, with 0--10 (usually 2) large glands (extrafloral nectaries) above or below the first pair of secondaries beneath, the glands convex on the upper and concave on the lower surface; midrib usually very pale to almost white above; secondaries 7 per side; veinlet reticulation very indistinct, the larger venation somewhat hairy beneath with simple hairs; inflorescence terminal, paniculate, 15--21 cm. long, 4--6 cm. wide, many-flowered, minutely hairy but finally glabrescent, the axes slender; cymules in the axils of the leaves or of more or less foliaceous bracts; calyx 5 mm. long, sometimes dark-blue, externally glabrous or glandular-tomentose and with several large glands, internally glabrous, the rim truncate or somewhat sinuate, often irregularly cleft; corolla yellow and pink-veined or bright-blue to purple, varying to lilac or pink, 1.8 cm. long, externally appressed-pubescent except on the lower part of the tube, internally glabrous, the throat somewhat papillose, the limb oblique, the lobes 4 or (usually) 5, 6--8 mm long, apically subacute, the middle one of the lower lip longer; stamens inserted in the lower part of the corolla-tube; filaments flattened, glabrous; anthers 2-lobed, the connective thickened; style stout, with some glanduliferous hairs near the apex; stigma unequally bifid; ovary globose, 5-celled, at first apically hairy but soon glabrescent; fruit drupaceous, 1.3--1.8 cm. long, red or pink to violet or bright-blue, soft, fleshy when ripe, the central cavity large, the carpels involute.

Collectors have found this plant growing on riverbanks and scattered on savannas or quite commonly in rainforests and their edges, at 10--30 m. altitude, in flower from December to March and in fruit from January to March; in both flower and fruit in August. The corollas are described as "purple-pink" on *Brass* 5753 and by Beer & Lam (1936) and as "lilac, the lower lip darker blue with a yellow stripe down the center" on *White* 1466; on *Hollrung* 651 they are said to have been "white". Bakhuizen (1929) reports them "yellow, tinged pink".

Vernacular names reported for the species are "kawra" and "Queensland beech".

Mueller (1885) cites an unnumbered Stewart collection from Saibai Island and one of Bäuerlen from Fly River. He notes that "The length of the petioles is variable, so the width of the leaves, particular-

ly at their base, and also the degree of paleness underneath."

Junell (1934) discusses the gynoecium morphology of this species on the basis of *Kajewski 1466*. Van Steenis asks, on a sheet of *Brass 5753*, "isn't this a *Faradaya*?" Seemann (1866) comments, in his discussion of *Ephielis*: "Yet the calyx of *Vitex macrophylla* differs from that of all other species of *Vitex* and seems to point to a generic difference."

Schumann & Hollrung (1889), speaking of *Hollrung 651*, say: "Die schönen und stattlichen Exemplare dieser Pflanze zeigen am Grunde des Blattes unmittelbar am Blattstiele zwei grosse Hohlräume, die ich an Exemplaren von Australien nicht finde. Ich möchte sie für extranuptiale Nectarien, die übrigens oberhalb der Hohlräume auch bemerkt werden, halten. Der Eingang in die etwa 5--8 mm langen and 5 mm tiefen Blasen liegt auf der Rückseite des Blattes, so dass sie diese Gebilde genau wie die Ameisenblasen bei *Tococa* über die Oberseite hervorwölben. Es wäre interessant, die physiologische Bedeutung dieser Dinge durch aufmerksame Beobachtungen festzustellen." They continue: the species is "Aus dem tropischen Australien bisher bekannt. In Wallich's Pflanzen findet sich nur Blätter von zwar ähnlicher Gestalt, aber mit dichter Behaarung der Rückseite. Nach seiner Angabe stammt die Pflanze von Amboina; F. v. Mueller hat dieser Art in Neu Guinea bereits nachgewiesen."

Pulle (1911) comments that "Die Exemplare aus Niederländisch Neu-Guinea zeigen, ebenfalls die von Schumann in Flora Kaiser Wilhelmsland p. 120 erwähnten grossen Hohlräume am Grunde des Blattes unmittelbar am Blattstiele." He cites *Branderhorst 23* from West Irian.

The Wallich material to which reference is made by Schumann & Hollrung (above) obviously is what has been called *G. macrophylla* Wall. by some writers, a name which is synonymous with *G. moluccana* (Blume) Backer. The *Vitex macrophylla* Anon. and *V. macrophylla* Hort. are synonyms of *Vitex agnus-castus* f. *latifolia* (Mill.) Rehd., while *V. macrophylla* H. J. Lam is now known as *V. macrofoliata* Mold. *Gmelina ledermanni* H. J. Lam is sometimes regarded as a synonym of *G. dalrympleana*.

Bailey (1901) lists *G. dalrympleana* from the islands of the Torres Straits, Cape Grafton, Cape York, and Rockingham Bay, citing unnumbered collections of Banks & Solander, Daemel, and Dallachy, remarking that the tree furnishes a useful timber for flooring boards and planking, closely resembling that obtained from *G. leichhardtii* (F. Muell.) F. Muell., citing Bailey's Cat. Queensland Woods 298a. Burkill (1966) asserts that the wood of *G. dalrympleana* is "used for boats in eastern Malaysia". Beer & Lam (1936) inform us that the tree bears fruit from January to March.

Mueller (1886) lists *G. dalrympleana* from Saiba Island; Schumann & Lauterbach (1900) report it from northern Australia, Amboina, and New Guinea, citing only *Hollrung 651* from New Guinea, but the Amboina reference, as stated above, is based on a misidentification of *G. moluccana*. Fedde & Schuster (1941) cite *Branderhorst 23*, also from New Guinea.

Bakhuizen regarded his *G. salomonensis* as intermediate between *G. moluccana* and *G. dalrympleana* and "possibly a hybrid between them" --

but the second of these supposed parental species does not occur in either the Solomon or Molucca Islands. Whitmore (1967) says "*G. dalrympleana*.....is a very distinct entity.....It has not been found yet east of mainland New Guinea and none of the Solomons' collections come near to it, including, in my opinion, the type of *G. salomonensis*." Bakhuizen (1929) cites Brass 959 & 1376 from Papua.

Whitmore (1967) cites the following collections as *G. dalrympleana*: NEW GUINEA: Papua: Brass 3539, 5753, 7666, 21719, 21915, & 28910; Hoogland 3405; NGF.1298, 3422, & 10374. Territory of New Guinea: NGF. 2922 & 9375. West Irian: Anta 179 & 250; Branderhorst 23; Van Royen 489L. NEW GUINEAN ISLANDS: Daru: Brass 6319. Fergusson: Brass 27281. Normanby: Brass 25388; NGF.8680. MOLUCCA ISLANDS: Aroe: Buwalda 5431. AUSTRALIA: Queensland: Kajewski 146; F. Mueller s.n. [Cape York].

Lam (1919) cites only Branderhorst 23 from New Guinea, listing the species also from "tropical Australia" on the authority of Bentham and Mueller. He comments that "Its affinity is with *G. macrophylla* [Wall. = *G. moluccana* (Blume) Backer]. The latter.....differs by the texture of its leaves and young parts, the obtuse apex, the subequal corolla-lobes, and the yellow (not blue) corolla.....Schumann u Hollrung.....speak of ant-hollows at the base of the leaves, which should have an opening, but we take them for nothing else but extrafloral nectaries, finding them convex in the upper, and concave in the lower surface of the leaf.....The species as Bentham describes it, seems not to possess the large glands at the base of the leaves; Schumann too, found the leaves of Australian specimens without glands. As, however, their number is much varying in 1 plant, we described no varieties, concerning the presence and absence of the nectaries."

It may be worth noting here that Lam (1919) mis-cites the Brown (1810) reference to this plant (see bibliography, above) as "1827" and the Wallich (1829) reference in the synonymy as "1828". The Mueller (1886) reference is sometimes mis-cited to vol. 6 (1875).

Citations: NEW GUINEA: Papua: *Btuerlen* 544 (Mb, N), s.n. [Fly River] (Mb); Brass 5753 (Bz--21274, N, W--1944646); W. MacGregor s.n. [Kussa, Mai 1890] (Mb). West Irian: Branderhorst 23 (Bz--21277, Bz--21279, Bz--25579, Ut--13813); *Wentholt* 179 (Bz--72742), 250 (Bz--72743). NEW GUINEAN ISLANDS: Saibai: C. Stewart 780 (Mb), s.n. [1885] (Mb, Mb). AUSTRALIA: Queensland: Brass 2185 (B, Bi); Kajewski 1466 (S); C. T. White 1466 (N, S).

GMELINA DALRYMPLEANA var. *SCHLECHTERI* (H. J. Lam) Mold., *Phytologia* 4: 178. 1953.

Synonymy: *Gmelina schlechteri* H. J. Lam, *Verbenac. Malay. Arch.* 226. 1919.

Bibliography: H. J. Lam, *Verbenac. Malay. Arch.* 216, 226--227, & 336. 1919; Bakh. in Lam & Bakh., *Bull. Jard. Bot. Buitenz.*, ser. 3, 3: 65. 1921; H. J. Lam in *Lauterb.*, *Engl. Bot. Jahrb.* 59: 94. 1924; A. W. Hill, *Ind. Kew. Suppl.* 6: 92. 1926; Fedde & Schust., *Justs Bot. Jahresber.* 47 (2): 245 (1927) and 60 (2): 573. 1941; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 67 & 93. 1942; H. N. & A. L. Mold., *Pl. Life* 2: 81. 1948; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 149 & 186. 1949; Mold., *Biol. Abstr.* 27: 2026. 1953; Mold., *Phytologia* 4: 178. 1953; Mold., *Résumé* 201--203, 297, & 456. 1959; Mold., *Fifth Summ.*

1: 333, 336, & 338 (1971) and 2: 524 & 879. 1971; Mold., Phytologia 46: 491. 1980; Mold., Phytol. Mem. 2: 323, 327, 328, & 549. 1980; Mold., Phytologia 51: 391 (1982) and 55: 336. 1984.

A small or medium-sized to tall, handsome canopy tree, 10--25 m. tall, pyramidal in shape; trunk smooth, often centrally hollow; bole 3--15 m. high, 12--60 cm. in diameter at breast height; buttresses to 1.5 m. high and 60 cm. long; branches spreading; bark rough, dark to pale gray-brown, about 3 mm. thick, slightly flaky, longitudinally and reticulately fissured; wood straw-color; branchlets subglabrous; leaves decussate-opposite; petioles subglabrous; leaf-blades firmly chartaceous, oblong or obovate-oblong, shiny or dull-green above, paler beneath, apically acute or shortly acuminate, basally truncate or broadly cuneate, glabrous on both surfaces when mature or the venation subpubescent beneath, with some (usually 2) rather large glands (extra-floral nectaries) below the lowest veins beneath; secondaries 6--8; inflorescence terminal, pyramidal, ferruginous-pubescent, basally foliose, the cymes borne in the axils of foliaceous, lanceolate, 5--10 mm. long bracts; calyx dark purple-green, about 4 mm. long and wide, externally densely appressed-pubescent, sometimes with some rather large glands intermixed, the rim truncate or obsoletely 4- or 5-dentate; corolla yellow, creamy-fawn, or white to pinkish, lavender, purple, or pale purplish-blue, the tube 10--10.5 mm. long, the lower portion externally glabrous, the remainder, as well as the lobes, externally appressed-pubescent, internally glabrous, the limb obliquely bilabiate, 4 lobes subequal and about 7 mm. long, the 5th lobe larger and about 1 cm. long, internally minutely pubescent; stamens exserted; filaments glabrous or with a few glanduliferous hairs; style filiform, with some glanduliferous hairs; stigma unequally bifid; ovary externally glabrous; fruit fleshy, white or greenish-white to pale- or bright-blue, glossy, purple or black when mature.

This variety is based on *Schlechter 17041* [Lam (1924) cites it as "17043"] from woods on the Kavi Mountains at 1000 m. altitude, in New Guinea, collected on December 25, 1908. Lam (1919) asserts that it is "A species, well characterized by its obovate-oblong leaves, its truncate, pubescent calyx, and its glabrous ovary". In his key he distinguishes it from typical *G. dalrympleana* (F. Muell.) H. J. Lam by the latter having a "pubescent calyx" [probably a lapsus for "ovary"]. The wood of the variety is said to be used by natives in its native haunts for the manufacture of canoes.

Collectors have encountered this plant in woods, on riverbanks, along brooks in old secondary forests, in disturbed rainforests on hillside slopes, in gallery forests, and "frequent in rainforests on limestone", at altitudes of 10--1150 m., in flower in February, April, May, July, and December, and in fruit in February, April, and May. Vernacular names reported for it are "adoen", "ai", "bauma", "mumuni", "noes", "oedoeoe", and "po'a".

The corollas are described as "yellow" on *Brass 1376*, "yellow tinged pink" on *Brass 959*, "white or pinkish" on *Brass 21915*, "creamy-fawn, the lower lobe mauve with a yellow patch" on *Hoogland & Craven 10167*, "lavender" on *Brass 28910*, "pale purple-blue" on *Womersley 9375*, "purple" on *Buwalda 5431*, and "cream, the lower lip with a pink apical part and a yellow patch in the throat" on *Hoogland 3405*.

Hoogland reports the tree "fairly common in regrowth on relatively shallow gray to brown wet clay soils with much iron gravel" and "very common in juvenile forests on fairly clayey soil with *Dillenia nalagi* as the most important tree".

Material has been misidentified and distributed in some herbaria as *Teijsmanniodendron holhrungii* (Warb.) Kosterm. and as *Faradaya* sp.

Citations: AROE ISLANDS: Koroŕ: *Bumalda* 297 [Boschproefst. bb. 25330] (Bz--21329). Trangan: *Buwalda* 440 [Boschproefst. bb. 25474] (Bz--21330), 5431 (Bz--72617, N, Ng--16961, Ng). NEW GUINEA: Territory of New Guinea: *Holhrung* 651 (Bz--21278, Mb, Mb, N); *Hoogland & Craven* 10167 (W--2896313); N.G.F. 2922 (Ng--6490); *Schlechter* 17043 (Ca--226308); *Womersley* 9375 (Ng--16945). Papua: *Brass* 959 (Bz--21275, N), 1376 (Bz--21276), 21915 (W--2603100), 28910 (W--2409583); *Carr* 15748 (N); *Hoogland* 3405 (Ng--16839, Ng, W--2213560); *Hoogland & Macdonald* 3422 (Ng--16837, W--2213567). West Irian: *Lundquist* 52 [Boschproefst. bb. 3267;] (Bz--21328), 133 [Boschproefst. bb/32852] (Bz--72965). NEW GUINEAN ISLANDS: Misool: *Pleyte* 1094 (Bz--72670).

Gmelina DELAVAYANA Dop, Bull. Soc. Bot. France 61: 321. 1915.

Synonymy: *Gmelina montana* W. W. Smith, Notes Roy. Bot. Gard. Edinb. 9: 107--108. 1916.

Bibliography: Dop, Bull. Soc. Bot. France 61: 321. 1915; W. W. Sm., Notes Roy. Bot. Gard. Edinb. 9: 107--108. 1916; Lévl., Cat. Pl. Yunnan 277. 1917; Prain, Ind. Kew. Suppl. 5, imp. 1, 115. 1921; Fedde & Schust., Justs Bot. Jahresber. 44: 254. 1922; A. W. Hill, Ind. Kew. Suppl. 6: 92. 1926; W. W. Sm., Notes Roy. Bot. Gard. Edinb. 17: 148 & 212. 1930; P'ei, Mem. Sci. Soc. China 1 (3): 116 & 121--122, pl. 23. 1932; Hand.-Mazz., Ann. Hort. Gothenb. 9: [67]. 1934; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 573. 1941; Worsdell, Ind. Lond. Suppl. 1: 441. 1941; Mold., Alph. List Inv. Names 25. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 57 & 93. 1942; H. N. & A. L. Mold., Pl. Life 2: 55. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 132 & 186. 1949; Mold., Résumé 170, 297, & 456. 1959; Prain, Ind. Kew. Suppl. 5, imp. 2, 115. 1960; Mold., Fifth Summ. 1: 289 (1971) and 2: 524 & 880. 1971; Mold., Phytol. Mem. 2: 279 & 549. 1980; Raj, Rev. Palaeobot. Palyn. 39: 357, 372, 395, 412, & 413, pl. 13, fig. 2. 1983; Mold., Phytologia 55: 333 & 493. 1984.

Illustrations: P'ei, Mem. Sci. Soc. China 1 (3): pl. 23. 1932; Raj, Rev. Palaeobot. Palyn. 39: 412, pl. 13, fig. 2. 1983.

A slender, floriferous, sometimes twining, unarmed shrub or subshrub, 1--3 m. tall; branchlets slender, terete, flexuous, at first minutely glandular-pubescent or -puberulent, later glabrescent; bark striate, light-brown; leaves decussate-opposite; petioles slender, 0.5--2 cm. long, minutely glandulose; leaf-blades ovate to subrhomboid or trapezoid, membranous or in drying thinly chartaceous, 2--5 cm. long, 1.5--3.5 cm. wide, apically acute or obscurely acuminate and mucronulate, marginally entire or obscurely sinuate to 3--many-lobulate, basally often inequilateral and obtuse or more or less broadly cuneate, glabrous and green or (in drying) olivaceous-brown above, glaucous and minutely or densely glandulose beneath when mature, sparsely pilosulous on the midrib; secondaries 3 or 4 per side, rather con-

spicuous above, prominent beneath; veinlets whitish and compressed above; cymes 1--7-flowered, forming a remote, narrow, lax, racemiform, terminal, cymose panicle 10--20 cm. long, puberulent; bracts foliaceous, linear or lanceolate, to 1 cm. long; peduncles slender, 1--1.5 cm. long, pilosulous and minutely glandulose or pubescent, apically 2-bracteolate; calyx campanulate, 0.7--1 cm. long, oblique, subbilabiate, externally very sparsely pilosulous and minutely glandulose or eglandular, the rim deeply 5-lobed, the lobes very slightly unequal, ovate or triangular, about 3 mm. long, apically acute or often shortly acuminate; corolla violet or blue-purple, 3--4 cm. long, externally slightly puberulous or pruinose above, the tube yellow, cylindrical, almost 2 cm. long, incurved, conspicuously ventricose-ampliate above the calyx, the limb bilabiate, 5-lobed, blue-purple, the lobes rounded, the lower lip galeate, 3-lobed, the middle lobe much larger, oblong, 12--18 mm. long, the upper lip short, entire or very slightly bilobed, 7 mm. long; stamens 4, included or subexserted, the filaments thick, sparsely and minutely capitate-glandulose; style slender, smooth; stigma bilobed, the lobes unequal; ovary externally glabrous; fruit drupaceous, ovoid, 13--15 mm. long.

The species is based on *Delavay 170* and *3595* from Ta-pin-tze and *Ducloux 4698* and *4707* from Pint-chouam, Yünnan, China. Dop (1915) says: "Cette espèce est voisine de *G. asiatica* L.; elle s'en distingue surtout par le calice à lobes nettement développés". It should be mentioned here that Prain (1921) dates the original publication of the species by Dop as "1914", but the page here involved was not actually effectively published until 1915. P'ei (1932) asserts that the leaves do not exceed "2.5 in length" but Dop's original description says "2--5 cm." long.

Smith (1916) asserts that the species "haec inter congeneres chinenses calycis lobis magnis, corollae tubo flavo, limbo bilabiato caeruleo-purpureo facile dignoscitur". Raj (1983) has studied and illustrated the pollen of this species based on *H. Smith 1815* from Szechuan, China, in the Stockholm herbarium.

The synonymous *Gmelina montana* is based on *Forrest 11662* from open situations among rocks on the western flank of the Tali Range in Yünnan, China, at 25°40' N. lat and 10,000 feet altitude, collected in August, 1913, and deposited in the Edinburgh herbarium. Smith (1916) remarks that the species grows at altitudes which are "remarkable for the genus". P'ei (1932) cites *Forrest 22499* from Szechuan and *Forrest 11662*, *15620*, & *22081* from Yünnan. He remarks that "Comparison of authentic material representing both species clearly indicates the identity of *Gmelina montana* W. W. Sm. with *G. delavayana* Dop".

The corollas on *G. delavayana* are described as having been "blue" on *Ten 261*, "violet" on *Ten 109*, "yellowish-purple and reddish" on *Rock 5077*, "ruddy-purple, yellowish at base" on *Forrest 22081*, and "limb purplish-blue, tube yellow" on *Forrest 11662*.

The plant has been encountered at the margins of thickets and by streams on mountainsides, at altitudes of 1700--3400 m., in flower in May, June, and August, and in fruit in September.

Citations: CHINA: Szechuan: *Forrest 22499* (W--1279006); *H. Smith 1815* (S). Yünnan: *Delavay 170* [?] (N--cotype?); *Forrest 11662* (Ca--231016, N--photo), *22081* (Ca--253060, W--1279009); *Rock 5077* (N, W--

1514614); *Ten 109* (W--1058168), 271 (Ca--487586). MOUNTED ILLUSTRATIONS: P'ei, Mem. Sci. Soc. China 1 (3): pl. 23. 1932 (Ld).

GMELENA ELLIPTICA J. E. Sm. in Rees, Cyclop., imp. 1 [London], 16:

Gmelina 2. 1810.

Synonymy: *Radix deiparae* Rumpf, Herb. Amboin. 2: 124--127, pl. 39. 1741. *Radix deiparae spuria* Rumpf, Herb. Amboin. 2: 127--129, pl. 40. 1741. *Gmelina villosa* Roxb., Hort. Beng., imp. 1, 46, nom. nud. 1814; Fl. Indica, ed. 2, imp. 1, 3: 86. 1832. *Radix deipara* Rumpf apud Roxb., Fl. Indica, ed. 2, imp. 1, 3: 87. 1832. *Gmelinae* sp. W. Griff., Notul. Pl. Asiat. 4: 179--180. 1854. *Gmelina grandiflora* Bocq., Adansonia, ser. 1, 2: 157. 1862. *Gmelina* [sp.] Blanco ex Fern.-Vilar in Blanco, Fl. Filip., ed. 3, Nov. App. 159 in syn. 1880. *Gmelina asiatica* Wall. apud C. B. Clarke in Hook. f., Fl. Brit. India 4: 582 in syn. 1885 [not *G. asiatica* L., 1753, nor Lour., 1953, nor Schau., 1918]. *Gmelina* sp. n. 2 W. Griff. ex C. B. Clarke in Hook. fl., Fl. Brit. India 4: 582 in syn. 1885. *Gmelina asiatica* Kurz apud Koord. & Valet., Meded. Lands Plant. 42: 197 in syn. 1900. *Gmelina integrifolia* Hunter ex Ridl., Journ. Roy. Asiat. Soc. Straits 53: 101 in syn. 1909. *Gmelina asiatica* Auct. ex Heyne, Nutt. Pl. Ned. Ind., ed. 1, 4: 118 in syn. 1917. *Gmelina villosa* Blume ex H. Hallier, Meded. Rijks Herb. Leid. 37: 58 in syn. 1918. *Gmelina asiatica* Burm. ex Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70 in syn. 1921. *Gmelina asiatica* var. *villosa* (Roxb.) Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70. 1921. *Gmelina asiatica* Burm. ex Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70 in syn. 1921. *Gmelina spec.* Griff. ex Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70 in syn. 1921. *Radix deiparae spuriae* "Lowara Rumph." apud Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70 in syn. 1921. *Gmelina asiatica* var. *villosa* Bakh. apud E. D. Merr., Enum. Philip. Flow. Pl. 3: 399 in syn. 1923. *Gmelina elliptica* Blume ex Mold., Suppl. List Inv. Names 3 in syn. 1941. *Gmelina asiatica* var. *villosa* Heyne ex Mold., Alph. List Inv. Names Suppl. 1: 10 in syn. 1947. *Radix disparae spuria* Rumpf ex Mold., Résumé 341 in syn. 1959. *Gmelina vestita* Blume ex Mold., Fifth Summ. 2: 524 in syn. 1971 [not *G. vestita* Wall., 1829]. *Gmelina grandiflora* Rich. ex Mold., Fifth Summ. 2: 523 in syn. 1971. *Gmelina asiatica* Wall. (in part) ex Mold., Phytologia 23: 432 in syn. 1972. *Gmelina elliptica* J. C. Sm. ex Mold., Phytol. Mem. 2: 408 in syn. 1980. *Gmelina asiatica* var. *villosa* Roxb., in herb.

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Illustrations: Rumpf, Herb. Amboin. 2: pl. 39 & 40. 1743; Koord. & Valet., Atl. Baumart Java pl. 278. 1914; Janssonius, Mikrogr. Holz. Java 805, fig. 294. 1926; Corner, Wayside Trees, ed. 2, 703, fig. 257. 1952; Janssonius, Key Javan Woods 213, fig. 294. 1952; Corner & Watanabe, Illustr. Guide Trop. Pl. 761. 1969; Menon, Mal. For. Rec. 27: 26, 40, & 42, fig. 36, 37, 80, & 84. 1971.

A shrubby, spreading, several-stemmed, small tree with a crown as wide as the height, or a scrambling, untidy, often evergreen, arborescent shrub, 2--8 m. tall, sometimes a thorny vine or liana to 10 m.

long; stems usually several from the same root cluster or branched from the base and freely re-branched, often spiny; bole to 1 m. long, straight, to 25 cm. in girth and 15 cm. in diameter; branches short or to 4 m. long, numerous, usually wide-spreading, often arching to the ground, they and the puberulous or villosulous branchlets often beset with sharp, rigid spines (aborted twigs) 0.5--5 cm. long, the young shoots terete, tawny-villous; outer bark white, light-gray, or grayish to yellowish-gray, pale-brown, brown, or olivaceous, thin, lenticellate, smooth or becoming slightly fissured; inner bark whitish or light-gray to greenish-white, moderately hard and heavy, very tough, brown toward the center, slightly bitter to taste; sapwood white or gray; medullary rays 1--7-[mostly 4-] seriate or wider, simple or compound; vessels often arranged in longer and shorter tangential rows; innermost part of the growth layers formed by a wood parenchyma lamella 4--7 cells thick, in this lamella the vessels are usually more numerous and strikingly wider than elsewhere; wood splinters burn for a long period of time; cambium purplish-brown; buds brown-hairy: leaves exstipulate, decussate-opposite, anisophyllous, conspicuously unequally petiolate; petioles slender, 0.5--4 cm. long, villous; leaf-blades somewhat leathery, flat, held in a horizontal or descending position, rather tough but flexible, elliptic, ovate-elliptic, or ovate to subrhomboid-elliptic, obovate, or trapezoid, 1--10.3 cm. long, 1--7 cm. wide, sometimes quite small and tending to be rhomboid, apically subacute to acute or obtuse, marginally usually entire when mature, basally acute or cuneate, dark- or deep dull-green and hairy (when young) or glabrous (when mature) above, much lighter or even yellowish or yellowish-green beneath, usually densely villous or woolly-tomentose to tomentellous (with simple hairs) beneath but sometimes only slightly pilose, with minute green glands at the base; secondaries usually 4 per side, almost straight, prominent beneath; inflorescence tawny-villous, racemiform and simple or paniculate; panicles terminal, few- to rather many-flowered, 2--7.5 cm. long, tomentose; bracts green, foliaceous, rather large, lanceolate or broadly lanceolate to oblong-ovate, 0.5--3.5 cm. long, 1--12 mm. wide, apically acute or acuminate to cuspidate, densely pubescent on both surfaces, falling after the flowers expand; flower-buds sooty-brown and silky; single cymes 1--3- [rarely 5-] flowered; flowers rather large, 2.5--3.5 cm. long, about 1.8 cm. wide, opposite, pendent, pedicellate, odorless; calyx obovate, green, 4--6 mm. long, apically truncate or obliquely and often obscurely minutely 4-denticulate, externally tomentose and with 3--7 flat, green, glabrous, permanent glands on one side; corolla mostly yellow or dull-yellow, bilabiate, large, 2.5--5.3 cm. long, externally densely pubescent, basally tubular, the tube itself basally very narrow, curvate, the throat obliquely gibbous and campanulate, the limb 4-lobed, the lower lip larger than the upper and entire, the upper lip (being a prolongation of the side of the throat) 3-lobed, the outer surface often rufous-villosulous or ferruginous-pubescent; stamens 4, didynamous, 2 reduced in size, yellow, the filaments curvate; anthers 2-celled; pollen white; style as long as the longer pair of filaments; stigma bilobed, the lobes very unequal and apically acute; ovary 4-celled, 4-ovulate,

externally with a tuft of tawny hairs at the apex, otherwise glabrous; ovules apically attached; fruit drupaceous, subglobose or globose to ellipsoid, ovoid, or obovoid, "resembling a cherry or small plum", at first greenish or green, later yellowish-green or yellow, 1.8--2.5 cm. long and wide, fleshy and watery when mature, pendent, 1- or 2-seeded, the pyrene obovate, obscurely 4-lobed, externally smooth, perforated by a conic cavity more or less on one side of the center (depending on the number of fertile cells); seeds hard and woody, oblong-obovate, about 1.3 cm. long and 0.8 cm. wide, smooth, slightly compressed, the integument single, brown, spongy; pericarp absent; embryo erect; cotyledons obcordate, conforming to the seed in size and shape; plumule 2-lobed; radicle inferior, minute.

Smith's original (1810) description of this species is: "Leaves elliptical, undivided, obtuse, downy beneath. Thorns none. -- Native, we presume, of the East Indies, confounded in the Linnaean herbarium with the foregoing [*G. asiatica*], from which it differs in having rather larger leaves, which are exactly elliptical and blunt, more densely downy beneath, and not lobed. There are no traces of thorns. The inflorescence is rather more compound, but the remarkable glandular calyx is the same. If a variety it is a very extraordinary one." His type specimen is deposited in the Linnaean Herbarium. His emphasis on the non-thorny character is doubtless due to his having seen only the small tip of a flowering branchlet.

Roxburgh's *Gmelina villosa* was based by him on a collection made in the Botanic Garden at Calcutta, the plant said to have come originally from Penang ["Pulo Pinang"] in Malaya and "from thence introduced by Dr. W. Hunter, into the Botanic garden at Calcutta, in 1802. In six years, the seedling plants had reached the size of small trees, and are in flower and fruit all the year round". His original description is detailed and excellent (far better than that of Smith) and well worth repeating here: "Trunk, in our young trees, straight, as thick as a man's leg. Bark olive-coloured. Branches numerous, spreading, and drooping in every direction; young shoots round, and villous. Leaves opposite, petioled, trapeziform, with the margins entire, except that the rounded side angles sometimes project into lobes, and the apex is generally acute, smooth on the upper side, pale and downy on the under one, from one to four inches long, and from one to two broad. Stipules none. Racemes terminal, simple, downy. Flowers opposite, pedicelled, drooping, and scarcely so large as in *G. asiatica*, dull yellow, on account of their being clothed with ferruginous pubescence. Bractes large, lanceolate, cuspidate, continuing until the flowers expand. Calyx small, obscurely four-toothed, with some large glands on the under side, as in *G. asiatica*, but larger and more numerous, permanent. Corol with a narrow, curved, cylindrical tube, and oblique gibbous-campanulate throat. Border four-parted, of which the lower one is much larger, and is a continuation of the protruded side of the throat. Filaments curved, one of the pairs much longer. Anthers bifid. Germ round, smooth, 4-celled, with one seed in each, attached to the top

of the axis. Style as long as the long pair of filaments. Stigma of two, very unequal, acute lobes. Drupe spherical, size of a large cherry, fleshy, smooth, when ripe yellow, one-celled. Nut obovate, obscurely four-lobed, smooth, four-celled, perforated by a conic cavity with its wide end downwards. The perforation is more or less on one side of the centre, according to the number of fertile cells, which is generally one or two only. Seed solitary, obovate-oblong, a little compressed. Integument single, brown, spongy. Perisperm none. Embryo erect. Cotyledons conform to the seed, obcordate. Plumula two-lobed. Radicle minute, inferior."

Fernandez-Villar (1880) regarded *G. inermis* Blanco (1837) as a synonym of *G. villosa* Roxb. (and therefor of what we now call *G. elliptica*), but Merrill (1918) has pointed out that there is no justification for this reduction -- Blanco was merely referring to a thornless form of the common Philippine species, *G. philippensis* Cham.

Merrill (1917), citing C. B. Robinson, *Pl. Rumph. Amb. 306* from Amboina, comments that "This is certainly *Radix deiparae* Rumph. and is equally certainly *Gmelina villosa* Roxb. Roxburgh's description was based on specimens from Penang, but he also cites *Radix deiparae* Rumph.....as representing his species. *Radix deiparae spuria*, which Rumphius thought distinct from his *R. deiparae*, undoubtedly is also referable to *Gmelina villosa* Roxb., although by many authors it has been referred to *Gmelina asiatica* Linn. The former was erroneously reduced by Linnaeus to *Gmelina asiatica* Linn.....while the latter also has been very generally referred to the same species. It is to be noted that in the Herbarium Amboinense t. 40 of Volumes I and II have been transposed."

The Baileys (1976) reduce *G. elliptica* to synonymy under *G. asiatica* and, indeed, the two taxa are certainly closely related.

Jack (1822) describes what he calls *G. villosa* as "spinosa, foliis rhomboideis subtus villosis....." Kanehira (1933) distinguishes the species from *G. palawensis* H. J. Lam in that it is a scandent shrub, the leaves elliptic and 10 cm. long, while in *G. palawensis* the plant is a tall tree, the leaves obovate or broadly elliptic and 10--15 cm. long.

Collectors have found *G. elliptica* growing on mountain-slopes, in mixed deciduous dipterocarp forests, along streams and among rocks, in sandy soil of beaches and secondary forests, in open forests and open grasslands, on overgrazed land and riverbanks, near streams in secondary forests, in brownish and limestone soil, overhanging stream-banks, along roadsides and roadcuts, on hillsides, in and at the margins of secondgrowth, in woods, primary forests, and thickets, deciduous bamboo forests, the edges of seasonal ponds, in rocky soil and dry compact soil near the coast, at altitudes of sealevel to 170 m. They have found it in flower from September to July and in fruit from September to April, as well as in July.

Backer & Bakhuizen (1965) report that in Java it inhabits brushwood, village greens, light forests, and forest borders, at altitudes of 1--500 m. Corner (1952) found it common in villages and open country in Malaysia, especially by the sea, and frequently grown as an irregular hedge -- "In shape and general appearance it resembles

....*Zizyphus*.....which is also thorny and has yellow flowers." Ridley (1911) lists the species from Burma, Thailand, Malaya, and the Nicobar Islands. It is said to be common in secondary growth on Basilan island in the Philippines. Tatamatsu refers to it as rare in sandy fields on the Palau Islands, but Canfield describes it as an abundant weedy tree in open areas along roadsides in volcanic clay soil along with *Cymbopogon* in these same islands. Sinclair reports it common on roadsides near the seashore in Singapore, while Smitinand found it "sporadic in scrub jungle" in Thailand.

Janssonius (1926) gives a very detailed description of the macroscopic characters of the wood. The wood anatomy is also discussed and illustrated by Menon (1971), including the semi-ring-porous wood, the ray tissue (which is of heterogeneous type III), and the acicular cellular crystals. A wood sample accompanies *Toroës 1120 & 2541* in the University of Michigan herbarium.

It is worth mentioning here that *LBrzing 3726* exhibits two leaves that are shallowly lobed exactly like those seen in the type specimen of *G. asiatica* in the Linnean herbarium. *Larsen & al. 31806* has the leaf-blades only slightly pilose beneath. *Yates 817* exhibits a fungal infection on the leaves. The label accompanying *Kanehira 198* indicates that the plant from which the material was taken had been introduced (on Corol Island). The unnumbered Vermoesen collection, cited below, does not have any indication on its accompanying label that it was taken from cultivated material, but I am assuming that it was. Corner (1952, 1956) refers to the leaf-blades as "white-hoary" beneath, but I have never seen any that would fit such a description.

The corollas are described as having been "yellow" on *Buwalda 7331*, *Canfield 402*, *Franco s.n.*, *Geesink & Santisuk 5223*, *Groff 6142*, *Niyomdham & al. 241*, *Ramos & Edano 48950*, *Shearard & Spence 82*, *Smitinand 575*, *Villamil 315*, *Williams 3041*, and *Yates 817 & 856*, *Bangham & Bangham 667*, *Beusekom & Phengkhlal 498*, *Chin 927*, *Docters van Leeuwen 1750*, *Elmer 9646*, *Gillis 11029*, *Larsen & Larsen 34046*, *Maxwell 75-318*, *Rajab 550*, *Santos 6148*, *Soepadmo 9138*, and *Stone 6908 & 9343*, "yellowish" on *Ahmin G. SAN.95465*, *Jumatin & Toyok SAN.92461*, *Medani 35034*, "bright-yellow" on *Chin 793*, *Stone 6170*, and by *Nairne (1894)*, "light-yellow" on *Elmer 12013*, "golden-yellow" by *Hallier (1918)*, "cadmium-yellow" on *Sheehan R.33*, and "pure clear yellow" on *Bangham & Bangham 628*.

The plant is described as a "tree" on *Toroës 2546*, "small tree" on *Bangham & Bangham 628*, "vine 30 feet long" on *Groff 6142*, "climber" on *Ahmin G. SAN.95465*, and "liana" on *Buwalda 7331*.

Gmelina elliptica, either under this name or that of a synonym, is listed by *Roxburgh (1814)* from Prince of Wales island on the basis of a Hunter collection; *Jack (1843)* lists it from Sumatra and Malacca. *Voigt (1845)* knew the species from Penang, Madura, and the Molucca Islands, asserting that in Calcutta and vicinity it flowers throughout the year.

Schauer (1847) cites the *Roxburgh* collection, originally from Penang, and *Zollinger 565* from Java, commenting: "Flores nutantes, iis *Gmel. Asiaticae* omnino similes, nonnihilo minores, obscure lutescentes, ferrugineo puberuli. Drupa carnosae, cerasi mole, luteae. Proxima certo *G. Asiaticae*, sin modo foliis subtus tomentosus, ramis pedulis

diversa". Miquel (1858) lists it from Sumatra, Java, Malacca, Celebes, and Bali, noting: "Arbuscula humanae altitudinis, ramis numerosis pendulis et foliis subtus tomentosus a *G. Asiatica* differt."

Clarke (1885) cites unnumbered collections of Wallich from Penang, Griffith and Maingay from Malacca, Thomson from Singapore, and Kurz from the Nicobar Islands. Koorders (1898) lists the species from Celebes and Java. Merrill (1903) cites *Ahern 331 & 618* from Mindanao, listing the species also from "southern Asia and the Malayan region". Brandis (1906) gives its distribution as "Pegu, Martaban, the Nicobar islands, the Malay Peninsula, and the Malay Archipelago".

Gamble (1908) cites *Curtis s.n.* from Langkawi, *Curtis 454*, *King s.n.*, *Phillips s.n.*, and *Wallich 1816* from Penang, *Scortechini 740* and *Wray 734* from Perak, *Griffith 6057* and *Maingay 1189* from Malacca, *Anderson s.n.*, *Deschamps s.n.*, *Kunstler 103*, *Kurz s.n.*, and *Thomson s.n.* from Singapore, *Kurz s.n.* from Burma and the Nicobar Islands, and *Forbes 1576 & 2642* from Sumatra.

Koorders (1912) says that *Gmelina elliptica* occurs throughout Java "im Djati walde und im sehr lichten Regenwalde häufig zerstreut oder gruppen weise" from sealevel to 600 m. altitude.

Hallier (1918) cites the following collections: Penang: *Galathea Exped s.n.* Sumatra: *Elbert s.n.* Borneo: *Korthals s.n.*, *Winkler 2270*. Lombok: *Elbert 750*. Sumbawa: *Colfs 126 & 212*, *Elbert 3676 & Gröndler in Elbert 3909*. Salajar: *Weber s.n.* Buton: *Elbert 2619*. Celebes: *Elbert 3001, 3038, & 3058* and *Forsten s.n.* Amboina: *Forsten s.n.* Basilan: *Hallier 3515*. Java (cultivated): *Hallier C.125*. He reports the species also from the Philippine islands of Malamawi and Mindanao, as well as from Burma, the Nicobar Islands, Malay Archipelago, Singapore, Thailand, Java, Bali, Negros, and Luzon.

Lam (1919) cites *Buitendijk HLB.914.324-226*, *Elbert HLB.908.308-433*, and *Forbes 1576 & 2342* from Sumatra, *Elbert 464 & 465*, *Junghuhn 524*, and *Zollinger 565 & 696* from Java, *Elbert 750* from Lombok, *Colfs 126 & 212* and *Elbert 3676 & 3909* from Sumbawa, *Elbert 2619, 3001, 3038, & 3058*, *Forsten HLB.908.267-844*, & *Weber HLB.898.112-522* from Celebes, *Winkler 2270* from Borneo, *Elmer 9646* and *Whitford 11809* from the Philippines, and *Ledermann 14164a* and *Raymundus 44* from Korrör in the Palau Islands.

Bakhuizen (1921) gives the species' natural distribution as Burma, Thailand, Malacca, Nicobar Islands, Pulu Pinang, Malaya, Philippines, and Indonesia; Lam (1924) adds the Palau Islands, citing the same two Ledermann and Raymundus collections cited in his 1919 work. Merrill (1921) cites *Villamil 315* and *Yates 30* from Papua and *Winkler 2270* from West Irian, giving the overall distribution, in his opinion, as "Burma to Malaya, the Philippines and the Moluccas". In his 1923 work he lists the following Philippine islands: Basilan, Bohol, Bongao, Cebu, Guimaras, Luzon, Masbate, Mindanao, Mindoro, Negros, and Panay, where, he says, the species is "Common in thickets and secondary forests at low altitudes". He records it also from "Burma, through Malaya to the Moluccas and the Palau Islands."

Ridley (1923) asserts that the species is common near the sea and in low woodlands inland in Singapore, Pahang, Malacca, Perak, Penang, Kelantan, Perlis, Langkawi, and the Nicobar Islands.

Dop (1935) cites unnumbered collections of *Balansa* from Tonkin, of

Pierre from Cochinchina, and of Couderc and Pierre from Cambodia, listing it also from Burma, the Malay Archipelago, and the Philippines. Fletcher (1938) cites the following collections from Thailand: Bourke s.n., Collins 934 & 2065, Kerr 2991, 10577, 10666, 10740, 14171, & 17330, Lakshnakara 358, Marcan 153, 914. & 1207, Put 74, Teijsmann 5941, Vanpruk 1013, and Winit 411, as well as an unnumbered Curtis collection from the Langkawi Archipelago. He lists the species from Burma, Indochina, Malaya, and the Philippines, and notes that "The above collections may contain more than one species. Kerr 10740, 10577, Put 74, Marcan 914, all have the ovary tufted with tawny hairs and a strongly tapering leaf base, whereas the true *villosa* has a glabrous ovary and a cuneate leaf base. The material, however, is so scanty that separation is not justified."

Burkill (1966) describes the species as "A shrub or small tree found throughout most of Malaysia; in the [Malay] Peninsula it is common." Chopra & al. (1969) encountered it in the Nicobar Islands. Voigt (1845) lists it as cultivated in the Calcutta area; in 1949 Williams found it cultivated in Zanzibar, while Sen & Naskar (1965) list it as cultivated in India. Loudon (1830) and Sweet (1830) assert that it was introduced into cultivation in England in 1818 from the "E. Indies".

Common and vernacular names reported for *Gmelina elliptica* include the following: bangana, baṅgana, baster St. Marias-wortel, batoe mera, bēlongeh, bidara, b'longoh, boea krاندjaag, boelangan, boengango, boewah, boewah kerandjang, bohól, bulang, bulang gajah, bulangan, bulangan, bulang hutan, bulang kechil, bulang kēchil, bulbuól, bulongan, common bulang, dadiangas, danhaṅgas, daun kranjang, gangabard, gān tu hu, kabia lu'ang, kajoe barijang, kajoe garijang, kajoe marijang, kalgebard, kalugebard, kalūṅgun, kananga woeba, kananga wuba, kang mao, kang māo, karanjam, kayo briang, kelanjan, kemandiang, kēmandiang warèng, kerandjang, keranjang, kilanjang, kranjang, loewaràng, lowarra, nóm mēo, ponranga, puhung, pukang mata hari, radix deiparae, radix deiparae spuria, radix desparae spuria, rais Madre de Deos, saonad, sarogang salaki, St. Mariaas wortel, talauan, talūn, talūṅgud, talūṅgun, talungund, tanlūṅgun, thawng maew, thong-maauw, tulungun, tuṅgólnol, villous gmelina, waren, warèng, warèng, warèng kētan, wēroēnganga, wewenganga, and wēwēnganga.

Heyne (1917) lists the known economic uses of the species -- its roots, wood, leaves, and fruit -- in Indonesia. Rumpf (1741) asserts that it provides the "Radix deiparae" or "Rais madre de Deos" of the Portuguese. Loureiro (1790) says of it: "Valent in doloribus articolorum, et effectibus nervorum, radix interne sumpta; folia externa applicata." It is employed in popular medicine in Cambodia. Maxwell (1906) suggests that it may have also been used as medicine for elephants. Sastri (1956) tells us that the plant is used in making poultices to treat swellings or headaches. Burkill (1966) affirms that in Malaya the plant is used to make good hedges and is also much employed in native medicines, mostly as poultices, the expressed juice of the roots, applied to the head, is believed to stop the loss of hair. The drupes, when pulped and mixed with garlic and lime, are rubbed on the

body in the treatment of dropsy and rheumatism.

The leaves are boiled and rubbed on the gums to cure toothache by acting as a counter-irritant, and the fruits are employed in the same manner for the same purpose. The juice of both the roots and the leaves is applied externally to wounds. The fruit is inedible and has a bitersweet taste; the juice is made into a mucilage or paste used in making a syrup used in cases of consumption and for coughs. In some areas the skins of the fruit are made into a tasty sweetmeat.. The roasted fruit is applied to itching feet caused by prolonged standing in stagnant water. An infusion of the slightly crushed fruit is used as an eye lotion. The juice of the fruit and/or the leaves is dropped into the ear to alleviate earache and rubbed on the body in treating rheumatism.

Chopra & al. (1969) also tells us that "The plant is applied to the head to prevent loss of hair." The juice of the leaves and fruits is employed to make a cooling drink to alleviate thirst in fevers and after a miscarriage. The leaf juice is also reported to be cathartic.

König (1894) reports that in native practice the roots of this plant, in order to obtain medicinal properties, must be dug according to the direction of the compass, only those growing in a northward direction would be beneficial, the others would actually have deleterious effect! Thw Portuguese in Goa, in times past, shredded the roots with a grater or a piece of shark skin, mixed this with the urine of very small children, and rubbed it on the forehead and temples to cure headache, as well as for skin eruptions and rheumatism. In Malaya is was mixed with lime to treat swellings, and as a rubifacient to cure anemia. The wood is said to have no economic use.

Among numerous errors and inaccuracies in the literature of this species may be mentioned the following: the Lam (1924) reference in the bibliography (above) is sometimes cited as "1925", but this later date is only the titlepage date for the volume -- the page reference which concerns us here was actually published in 1924. Koorders & Valetton (1900) cite the Clarke (1885) reference to page "583", but it actually should be p. 582. They also describe the flowers as "25--35 M." long, obviously a misprint for 25--35 mm.. Clarke (1885) and Jackson (1893) cite a "*Gmelina asiatica* Wall." to Wallich's "Numerical List", no. 1818 (1831), but Wallich there definitely credits the binomial to Linnaeus.

The Fernandez-Villar (1880) reference is often cited as "Naves, Fl. Filip. 4: 159"; the S. Moore (1925) reference is sometimes credited to "Rendle" or "S. Moore in Rendle".

It is of interest to note that Beusekom & Phengkhlai encountered *Gmelina elliptica* "in poor deciduous forests and bamboo jungles in limestone areas" in Thailand, and Robinson, in Amboina, describes the species as a "tree, shrub, or woody vine, 3 m. x 8 cm., common everywhere". Also, it should be pointed out that Gillis 11029 is said to have been collected from a plant grown from seed of Fairchild & Dorsett 2969 from Guyana, but the latter is *G. asiatica* L., as can be seen from the Fennell 1003: sheet, also said to have originated from the same collection.

Material of *Gmelina elliptica* has been misidentified and distrib-

uted in some herbaria as *G. asiatica* L., *G. philippensis* Cham., *G. speciosissima* G. Don, and even as *Scrophulariaceae*. On the other hand, Lambert & Brunson 26 and Merrill 918 are *G. elliptica* f. *lobata* (Gaertn.) Mold., Achmad 239, Bakhuizen 1649, Clemens 286, Leeuwen 3124, and Lbrsing 12957b are mixtures of the typical form of the species and f. *lobata*, and Gansau SAN.47802 and Keng & al. K.6210 [field no. 142] are not verbenaceous.

Citations: JAMAICA: Harris & Britton 10784 (N); Kidder s.n. [9. Mch. '85] (Ca--10749). ZAIRE: Vermoesen s.n. (Br). INDIA: State undetermined: Blackburn s.n. (T); Kamohbvenor 202 [Galathea Exped. 2011/2022] (Cp, Cp, E--photo, Ld--photo, N--photo); Roxburgh s.n. (Br, Br); Richard s.n. (P); Wallich 1886 (Cp, Cp). THAILAND: Beusekom & Phengkhlat 498 (Ac, Ac); Charoenmayu 415 [Herb. Roy. For. Dept. 5484] (A); Charoelphol, Larsen, & Warncke 3428 (Ac), 4093 (Ac); Congdon 241 (Ac); Geesink & Santisuk 5223 (Ac); G. W. Groff 6142 (Ca--992343, N); Kostermans 1191 (W--2039873); Larsen & Larsen 34046 (Ac, Ld); Larsen, Larsen, Nielsen, & Santisuk 31806 (Ac, Ld); Maxwell 71-312 (Ac), 75-318 (Ac), 76-470 (Ac); Niyomdham & al. 241 (Ac); Put 74 (Ed); Smitinand 575 [Herb. Roy. For. Dept. 11919] (Ld); Teijsmann 5941 (Bz--21261, Bz--21262). CAMBODIA: B. C. Stone 9343 (K1--12615). VIETNAM: Cochinchina: Pierre s.n. [Bien Loe, 2/1877] (B), s.n. (B, Ca--53768). State undetermined: G. W. Groff 5694 (Ca--300177, Gg--31097). MALAYA: Johore: M. R. Henderson 18209 (Bz--21269). Malacca: W. Griffith s.n. [1845] (Br). Penang: B. C. Stone 6170 (K1--5907). Perak: Chin 793 (K1--19926), 927 (K1--19927); Spare 36731 (Bz--21348). Selangor: Kassim 550 (K1--1550, Ne--33497). Singapore: T. Anderson 134 (Pd); Sinclair 6414 (W--2913198). Trengganu: Soepadmo & Mahmud KLU.9138 (K1--12933, Ne--29985). MALAYAN ISLANDS: Langkawi: B. C. Stone 6908 (K1--7775, K1). Prince of Wales: Hunter s.n. [Herb. Roxburgh] (F--photo, Ld--photo, N--photo, Si--photo). Tioman: B. C. Stone 11868 (K1--19951). PHILIPPINE ISLANDS: Basilan: DeVore & Hoover 2 (W--449552); Salaudin, Herb. Philip. For. Bur. 31384 (N). Bohol: R. C. McGregor, Herb. Philip. Bur. Sci. 1220 (W--439202). Bongao: Yates, Herb. Philip. Bur. Sci. 36303 (Bz--21208). Cebu: R. C. McGregor, Herb. Philip. Bur. Sci. 1704 (Bz--21218, N, W--439269). Guimaras: J. W. Ritchie, Herb. Philip. For. Bur. 38 (Bz--21212, N, W--625713). Jolo: Kienholz s.n. [June 1923] (Ca--262821); Kondo & Edaño 8871 [Philip. Nat. Herb. 38839] (Bi). Luzon: J. V. Santos 6148 (W--2246858). Masbate: W. W. Clark, Herb. Philip. For. Bur. 1003 (N, W--627141). Mindanao: Ahern 331 [31] (Bz--21213, W--445673), 6187 (Bz--21214); M. S. Clemens 286 in part (Bz--21215, Mu--4100); DeVore & Hoover 136 (W--449629); Elmer 12013 (Bi, Bz--21216, E--118643, N, vt, W--712136); Escritor, Herb. Philip. Bur. Sci. 21403 (W--900902); Fénix, Herb. Philip. Bur. Sci. 15809 (Cm), 26124 (W--1293484); Franco, Herb. Philip. For. Bur. 31523 (N); Jacquinet s.n. [1841] (B); Mearns 169 (W--447506), s.n. [Surigao, April 20, 1904] (W--447610, W--447611); Pascua, Herb. Philip. For. Bur. 30231 (Bz--21211, Ca--320988, N, S); Ramos & Edano, Herb. Philip. Bur. Sci. 36850 (Bz--21209, W--1264733), 48950 (Ca--324252); C. B. Robinson, Herb. Philip. Bur. Sci. 6692 (Bi); C. M. Weber 1028 (Cm, W--712258); Wilkes, U. S. Expl. Exped. s.n. [Mindanao] (T); R. S. Williams 3041 (N, N, Qu). Mindoro: E. D. Merrill 914 (E--118649, N, W--435883);

Merritt, Herb. Philip. For. Bur. 9798 (Br, E--118646). Negros: Elmer 9646 (Bz--21217, E--118647, N, W--705400); W. D. Pierce P.280 (W--1599594). Panay: Ramos & Edaña, Herb. Philip. Bur. Sci. 31488 (Bz--21210). Sulu: C. Wright, Wilkes Exped. s.n. [Sulu Archipelago] (W--40647). PALAU ISLANDS: Babeldaob: Canfield 402 (W--2839219). Koror: Kanehira 2068(N). Palau: Kanehira 2068 (W--1967159); Shearard & Spence 82 (W--2985374). CAROLINE ISLANDS: Arekalong: Takamatsu 1646 (N, W--2643582). Corol: Kanehira 198(N). GREATER SUNDA ISLANDS: Anambas: M. R. Henderson 20147 (Ca--203934). Banguay: Castro 35 [Castro & Melegrito 1334] (Ca--241483). Bintan: Blunnemeijer 6532 (Bz--21256). Bohay Dulang: Jumatin & Toyok SAN.92461 (Ld). Celebes: Adjunct-Veearts & Gorontalo s.n. (Bz--21227); Boschproefst. 24 (Bz--21223); Docters van Leeuwen 884 (Bz--21128, Bz--21129), 1750 (Ut--70620), s.n. (Bz--21137); Kjellberg 18 (Bz--21235, S); Koorders 110 [19527b] (Bz--21232), 19525b (Bz--21234), 19526b (Bz--21233); Lam 2462 (Bz--21221); Noerkas 112 (Bz--21225, Bz--21226, Ut--58006); Pesik 24 (Bz--21222); Posthumus 2266 (Bz--21220); Rachmat 255 (Bz--21228); Rensch 1441 (Bz--212001); Teijsmann 11885 (Bz--21225, Bz--21226), 14156 (Bz--21224). Java: Backer 1380 (Bz--21152), 2279 (Bz--21123), 3379 (Bz--21126), 4383 (Bz--21114), 7919 (Bz--21155), 11317 (Bz--21134, Bz--21135), 13971 (Bz--21111), 17206 (Bz--21112, Bz--21113), 17563 (Bz--21121), 17909 (Bz--21156, Bz--21157), 18835 (Bz--21133), 23367 (Bz--21151), 24576 (Bz--21158), 25490 (Bz--21150), 26506 (Bz--21122), 34141 (Bz--21074, Bz--21075), 34142 (Bz--21076), 34143 (Bz--21077), 34144 (Bz--21078), 34146 (Bz--21079), 34147 (Bz--21080); Bakhuisen 391 (Bz--21072), 1116 (Bz--21104), 1188 (Bz--21095), 1649 in part (Bz--21117, Bz--21118, Ca--235322, Ca--265957, Ut--24902A); Beumée 1731 (Bz--21199), 1880 (Bz--21089), 3473 (Bz--21094), 3486 (Bz--21140, Bz--21141), 3888 (Bz--21142), 4767 (Bz--21116), 5061 (Bz--21131), s.n. [1/11/1924] (Bz--21124, Bz--21125); Boerlage s.n. [16 Mrt. 1897] (Bz--21119); Bruinier (?) 208 (Bz--21130); Buijsman 200 (Ut--11492); Buwalda 7331 (Bz--72918); Edeling 62 (Mi), s.n. (Bz--21105); Franck 116 (Bz--21088); Hallier 46 (Bz--21143), s.n. (Bz--21100); Herb. Bot. Stockh. s.n. (S); Hoogerwerf 38 (Bz--21087); Koorders 272* [28172b] (Bz--21177), 363 [9734b] (Bz--21159), 497* [25213b] (Bz--21174, Bz--25575), 894* [30361b] (Bz--21161), 1149* [20655b] (Bz--21180), 1751* [31099b] (Bz--21160), 1864* [30220b] (Bz--21181), 9735 (Bz--21172), 9736 (Bz--21173), 9737b (Bz--21169), 11681b [1785m] (Bz--21168), 11682b (Bz--21170), 13491b (Bz--21171), 14816b (Bz--21162, Bz--21163), 21323b (Bz--21181), 25213b (Pd), 25502b [426d] (Bz--21175, Bz--21176, Bz--25576), 27584b (Bz--21164), 27601b (Bz--21165, Bz--21166), 36772b (Bz--21167); Kostermans 4009 (Bz--72917); Kuntze 4961 (N), 5304 (N); Lbrzing 667 (Bz--21128), 972 (Bz--21127), 3361 (Bz--21251), 3726 (Bz--21252); Mascamp 35 (Bz--21073); Mousset 443 (Bz--21153); Noltée 4009 (Bz--21091, Bz--21092); Reinwardt s.n. (S); Siebold s.n. [Java] (Mu--740); Slooten 231 (Bz--21101, Bz--21115); Soegandredjo 267 (Bz--21146, Bz--21147); Thorenaar 188 [9] (Bz--21102, Bz--21103); Ullée 4 (Bz--21154); Valetton s.n. [2 Mrt. 1905] (Bz--21120); Wanman s.n. (S). Kalimantan: Kostermans 21273 (E--1830233, N); Winkler 2270 (Bz--21064). Kangean: Backer 26769 (Bz--21192), 27937 (Bz--21183); Dommers 25 (Bz--21193), 210 (Bz--21184). Lingga: Blunnemeijer 6982 (Bz--21255). [to be continued]